REAL-TIME SOIL CHARACTERIZATION AT FERNALD

In situ gamma spectrometry systems, geographic positioning systems, and wireless data communications are assembled into real-time soil characterization systems that improve soil remediation efficiency and reduce both cleanup and characterization costs.

■ PROBLEM/OPPORTUNITY

Traditional methods of characterizing radiological contamination in soil for the purpose of directing soil remediation and verifying cleanup criteria have involved conventional soil sampling and laboratory analysis with long turnaround cycles. These methods are expensive, time-consuming, and can delay cleanup. The use of real-time in situ gamma measurement technologies in close coordination with excavation activities can result in much lower analytical costs, immediate data return, and fewer interruptions of excavation schedules when contamination involves gamma-emitting radionuclides.

■ APPROACH

The Environmental Assessment Division (EAD) has supported the environmental remediation program at the former Fernald Feed Materials Production Center, now the Fernald Closure Project (FCP), since 1991. Since 1997, EAD has been involved in a partnership with the Idaho National Engineering and Environmental Laboratory (INEEL), Fluor Fernald, U.S. Department of Energy (DOE)-Fernald, and DOE's Environmental Measurements Laboratory. This partnership has fostered the deployment of advanced real-time gamma detection systems in support of soil remediation under DOE's former Accelerated Site Technology Deployment program. The effort has involved assembling technologies into advanced detection systems able to rapidly survey and map large surface areas and delineate contaminated soils, with decision-quality field measurements of radiological contaminants to support soil excavation and segregation. Our role has involved specifying the design and performance requirements of the systems and evaluating and documenting data quality and system performance (including costs).

Three main types of gamma ray detector platforms are deployed:

- Mobile sodium-iodine (NaI) detectors for large area surveys of uranium-238, radium-226, and thorium-232;
- Tripod-mounted high-purity germanium (HPGe) detectors for precision stationary measurements of the same nuclides; and
- Excavator-mounted NaI or HPGe detector systems for surveys in deep excavations, trenches, and high contamination areas.

■ RESULTS

The deployment of these systems has resulted in significant benefits compared with conventional sampling and analysis:

- Substantial analysis cost savings,
- Reduction in excavation schedules, and
- Reduction in soil disposal costs.

In addition to the impacts on costs and schedules, real-time in situ gamma detection technologies produce generally superior overall soil characterization results compared with conventional sampling and analysis. The superior results can be attributed to the collection of a far greater number of measurements by in situ methods than is practical with physical sampling and analysis.

■ FUTURE

The technologies and advances gained at Fernald are currently being considered for use at several other DOE remediation sites, including the Miamisburg and Ashtabula closure projects in Ohio, and the East Tennessee Technology Park remediation near Oak Ridge.

■ COMMUNICATION OF RESULTS

The real-time characterization program at Fernald has yielded a number of technical documents and papers. As the program has become the accepted means of soil characterization, several technical reports documenting the performance of the systems have been written by the project partners and have been approved by DOE and involved regulators. A number of journal articles and conference presentations also have been developed from the work. Currently, EAD is preparing a guidance document on using real-time approaches to support site closure.

Real-time detection systems include, from left to right, the NaI-based Radiation Scanning System (RSS), tripod-mounted HPGe, and the Excavation Monitoring System (EMS).

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